

PREPARING FOR SOURCE TESTING AND FUEL SAMPLING AS REQUIRED TO COMPLY WITH EPA'S SECTION 114 INFORMATION REQUEST

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1. **PM_{2.5} Particulates plus Condensables**
2. **Total Filterable Particulate**
3. **Metals**
4. **Dioxins and Furans**
5. **Formaldehyde**
6. **HCL and HF**
7. **CO, THC, NO_x AND SO₂**
8. **Fuel Variability Study**

Recommended Method for Filterable PM_{2.5}

- EPA Other Test Method 27 (OTM 27) – Isokinetic Sampling Train; capture of PM_{2.5} using an in-stack cyclone; gravimetric analysis

Alternative Method

- No Alternative for Dry Sources; For Wet Sources Use EPA Method 5 – Isokinetic Sampling Train; assume all collected particulate is filterable PM_{2.5}; gravimetric analysis

Recommended Method for Condensable PM

- EPA Other Test Method 28 (OTM 28) – Dry Impinger Method; aqueous and organic fractions; gravimetric analysis
- OTM-28 Completed in Conjunction with OTM-27 or EPA Method 5

Alternative Method

- None

Recommended Method

- EPA Method 5
- In Conjunction with EPA Method 29
- In Conjunction with EPA Method 26A

Note:

- Test Plan Indicates that Total Filterable PM can be determined by analyzing the cyclone catch from the PM_{2.5} Train. EPA is now not recommending this approach

PM_{2.5}, Condensable PM, and Total PM Sampling Issues

- Complete PM_{2.5}, Condensable and Total Filterable PM testing at the same time as the metals sampling
- 4-hour duration test runs required for both trains
- For wet sources, use EPA Method 5 for Measurement of PM_{2.5}
- Use OTM-28 as the back-half of the OTM-27 (PM_{2.5} Sampling Train)

OR

- Use OTM-28 as the back-half of the M5 Sampling Train for Wet Sources

Antimony (Sb)

Lead (Pb)

Arsenic (As)

Manganese (Mn)

Beryllium (Be)

Mercury (Hg)

Cadmium (Cd)

Nickel (Ni)

Chromium (Cr)

Phosphorus (P)

Colbalt (Co)

Selenium (Se)

EPA Recommended Method

- EPA Method 29 – Isokinetic Sampling Train (Collection of metals on heated filter and in nitric/peroxide solution; collection of Hg on filter, nitric/peroxide solution and KMNO₄; Analysis via ICP or ICP-MS (SW-846 6010 or 6020) for all metals except Hg; Hg analysis via cold vapor AAS (SW-846 7470A))

Alternative Methods (Hg only)

- ASTM D6874-02 (Ontario Hydro Method); provides for Hg Speciation
- EPA Method 101A

- Minimum sample volume of 4 m³ per run or a minimum run time of 4-hours
- Metals sampling must be completed simultaneous with the PM_{2.5}, Condensable PM and Total Filterable PM measurements
- Total Filterable PM can be measured with the metals by following Sections 8.2.6, 8.3.1 and 8.3.2 of Method 29
- If not measuring Hg, eliminate the acidic permanganate absorbing solution
- Front and back-half fractions must be analyzed separately
- Sample recovery is complex
- Audit samples may be required

Recommended Method

- EPA Method 23; Modified EPA Method 5 Requiring Isokinetic Sampling; Collection on Filter and XAD-2 Trap; Analysis via HRGC/HRMS
- Must Use EPA Method 23; Not SW-846 0023A

Alternative Method

- None

- Minimum sample time of 4 hours or 2.5 cubic meters sample volume (~90 cubic feet)
- Conduct measurement for D's/F's in conjunction with formaldehyde sampling and THC, CH₄ and CO measurements
- EPA recommends eliminating the MeCl₂ rinse
- Acetone and Toluene rinses can be combined
- Front and back-half portions of the train can be combined
- Method specific glassware cleaning procedures required
- XAD traps prepared and spiked by laboratory
- Filters prepped by laboratory (no spikes added)
- Audit samples may be required

- Pick the analytical laboratory based on experience with the method and reputation
- If you have no prior experience with the method, the testing consultant should be able to help
- Again: Method 23 is NOT the same as 0023A
- Check that any Method 23 modifications implemented by the lab have been pre-approved by EPA
- Most laboratories provide a full analytical data package for this analysis. Surcharge may apply.
- Lab should pre-certify XAD-2 resin

EPA Recommended Method

- EPA Method 320 – Instrumental method employing Fourier Transform Infrared (FTIR) Spectroscopy

Alternative Methods

- RCRA Method 0011 – isokinetic sampling train (collection in DNPH; HPLC analysis)
- EPA Method 316 – isokinetic sampling train (collection in water; analysis via modified pararosaniline)
- Other methods will require regulatory approval

- Collect a minimum of 2.5 m³ per test run or for a run time of 4-hours
- Measure formaldehyde at the same time as the CO, THC and CH₄ monitoring and the Dioxin/Furan sampling
- EPA Method 320 is a complex instrumental procedure. Not all test firms may be familiar with the Method
- If EPA Method 320 is employed, all method QC must be followed
- The DNPH solution used in the SW-846 sampling train must be used within 5-days of preparation. DNPH is also a hazardous solution that must be handled accordingly

EPA Recommended Method

- EPA Method 26A– isokinetic sampling train (collection in 0.1 N H_2SO_4 ; IC analysis)

Alternative Method

- EPA Method 26 - non-isokinetic version of Method 26A (utilizes midget impingers; IC analysis)

Other Methods (will require EPA approval)

e.g. FTIR instrumental analysis

- EPA is requiring a minimum run time of 2-hours
- Does not need to be run in conjunction with any other parameters
- Filterable PM can be measured using this method
- Sources with entrained water droplets must use Method 26A
- An audit sample may be required

Recommended Methods for Carbon Monoxide

- EPA Method 10 (instrumental method – NDIR)
- EPA Method 10A (collection in a Tedlar bag – spectrophotometry)
- EPA Method 10B (collection in a Tedlar bag – GC separation and oxidation/reduction catalytic reduction to methane; FID analysis)

Recommended Method for NO_x

- EPA Method 7E (instrumental method (chemi-luminescence))

Alternative Methods for NO_x

- EPA Method 7, 7A, 7B, 7C, 7D (wet chemistry methods)

Recommended Methods for Sulfur Dioxide

- EPA Method 6C (instrumental method (e.g., UV, NDIR))

Alternative Methods

- EPA Method 6 (wet chemistry)

Recommended Methods for THC

- EPA Method 25A

Alternative Methods

- None

Recommended Method for Methane

- EPA Method 18

Alternative Methods for Methane

- EPA Method 320

Note: Use of a methane/non-methane analyzer or a non-methane cutter analyzer is not permitted

Recommended Method for O₂ and CO₂

- EPA Method 3A

Alternative Methods for O₂ and CO₂

- EPA Method 3B

- Use of facility CEMS is acceptable....however
- If facility CEMS are not available, use transportable CEMS provided by testing contractor
- Transportable CEMS will require electrical hookup and location near the stack
- THC, CH₄ and CO test runs are to coincide with formaldehyde and Dioxin/Furan test runs
- O₂ and CO₂ test runs should be in conjunction with all isokinetic sampling trains
- SO₂ and NOx test runs – minimum 1-hour duration

- **Characterization of “Gozintas” During Stack Testing**
 - **Concurrent with Stack Test Runs**
 - Analysis of One Composite Sample per Test Run
 - Each Composite = 3 samples/run, equally spaced (9 total)
 - **Hg, Cl, Fl + Select Metals (Sb, As, Be, Cd, Cr, Co, Pb, Mn, Ni, P, Se)**
 - **Comparison with Stack Tests**
 - Capture and Control of HAPs
 - % Control, Variability
- **30-day Variability**
 - **9 additional composites (3 samples each) over 30 Days (18 total)**
 - Any 30-day Period Around Stack Test
 - **Hg, Cl, Fl + Select Metals (Sb, As, Be, Cd, Cr, Co, Pb, Mn, Ni, P, Se)**
 - **MACT Limits Should be Achievable with Worst Case Gozintas**
 - **30-day Variability – Reasonable Data Gathering v. Long-term Variability?**
- **Multiple Fuels – Normal or Requested**

- i) Approved Sampling Protocol**
- ii) Chain of Custody**
- iii) Sampling QA/QC Procedures Followed**
- iv) Results by Composite Sample**
- v) Documentation of Conformance with Test Protocol (Facility, Lab)**
- vi) Analysis QA/QC Procedures Followed (Lab)**
- vii) Summary of Test Program Results (Facility, Lab)**

EPA seeks reliable data based on common sense specifics. If in doubt, call Jim Eddinger (ICI) or Another EPA Contact for Guidance

- ASTM D2234-00 (coal), D6323-98 (2003)(biomass), or custom;
- Belt or Feeder
 - 6” wide sample from stopped belt, or representative feed sample, >2 #
 - Can the conveyor be stopped during a stack test run?
 - Clean plastic shovel, clean zip lock bag
 - Is the sample representative of its stack test run?
 - Day bins or Intermediate storage?
 - Rat holing, classification, pant leg diverters, etc.
- Fuel Pile or Truck
 - Is pile representative of stack test run?
 - Day bins of intermediate storage?
 - How variable is fuel?
 - Minimum 5 uniform samples from 18” inside pile
 - Clean plastic shovel, clean zip lock bag

- **Liquid Fuels (tank) Generally Uniform & Representative**
- **Manual Sampling ASTM D 4057**
- **Automatic Sampling ASTM D 4177**
- **Facility or Fuel Supplier**

- Mix and pour over a clean plastic sheet
- Break pieces > 3 inches
- Subdivide into 4 equal pie slices
- Sample to lab, keep another

- **Pre-qualify Lab**
- **Communicate!**
 - **Who, What, Why, Where, When**
 - **Solicit Suggestions**
 - **Detection Limits**
- **Lab Review and Comment of Testing Plan**
- **Lab – sub pie composites as necessary, grind sample to ASTM E829-94 (SW-846-7740 Se)**
- **Lab Sample Prep (prescribed methods)**
- **Lab Analysis (prescribed methods)**
- **Interpretation of Results**

Develop scope of work and select candidate source testing contractors

- **Clearly state the objectives of test program**
- **Clearly communicate work scope**
- **Specify test methods or provide EPA table of acceptable methods**
- **Identify source or sources to be tested**
- **Provide detailed information about the source**
- **If Possible Arrange for a Contractor Site Visit**

Send out RFQ sooner than Later

- **Select candidate contractors you know and trust or base your choice on their experience with large scale projects and depth of resources and staff**

NUMBER AND LOCATION OF TEST PORTS

- Relative to upstream/downstream flow disturbances
- Height above deck
- Backing distances to railing or obstruction
- Height above railing
- Port dimensions (inside diameter, port sleeve length, bolted flange or threaded port cap)
- Stack diameter
- Stack access (roof-top, OSHA platform, scaffolding, caged ladder, stairs)
- Availability of monorails or monorail hardware

- **Stack conditions (gas stream temp., moisture, velocity, etc.)**
- **Prior test results**
- **Can the plant provide space to stage equipment and recover samples**
- **Place near stack to locate CEMS and/or sample recovery trailer**
- **How will equipment be delivered to the stack (boom for pulley wheel, crane, stair access, elevator to roof, etc.)**
- **Power requirements (obtain from the contractor)**

Identify required safety training

- Onsite or off-site safety training requirements

Identify any special requirements for site access

- Background check
- Drug testing

Identify PPE required

- Typical: hard hat, steel-toed shoes, safety glasses with side shields, hearing protection
- Additional: climbing harness, respiratory protection, Nomex coverall, long sleeve shirts at all times

Identify any special Facility rules

- e.g. facial hair rules, no matches or lighters on-site, company name on any vehicles entering plant site, etc.

- Agree upon a test schedule and obtain contractor commitment
- Notify state agency and EPA 21 days in advance
- EPA recommends preparation of a test protocol but it will not be reviewed and is not required
- Remove port caps or flanges prior to the test
- Put in all necessary work orders for scaffolding, port cap removal, electrical setup, monorail hardware, etc.
- Arrange for experienced operators for test
- Check EPA Website for method approvals, changes to program, etc.
- Ask questions of EPA if necessary

- Is a recovery area available on-site or should the contractor provide a recovery trailer
- Ice for sampling trains – consider having ice delivered to the site
- Work out detailed testing schedule
 - Dependent on the number of test ports available and test crew size
 - Worse case scenario will require 5 separate isokinetic sampling trains and a CEMS probe
 - If ports are limited and a short test time is critical, consider testing with around the clock with two test crews
 - Remember that 8-hours of test run time takes longer than 8-hours

Example schedule (2 test ports and 4 person crew)

- Day 1: Equipment setup; safety meeting
- Day 2: Complete run 1-2 for Metals/Tot. PM, PM_{2.5}/Condensables
- Day 3: Complete run 3 for Metals/Tot. PM, PM_{2.5}/Condensables
- Day 3: Complete run 1 for D's/F's, formaldehyde, CO, THC, CH₄
- Day 4: Complete Runs 2-3 for D's/F's, formaldehyde, CO, THC, CH₄
- Day 5: Complete Runs 1-3 for HCl/HF, NO_x and SO₂

- **Operate the process at normal maximum conditions during the stack test**
- **Record pertinent boiler operating data for a 30-day period that encompasses the test (heat input, fuel composition, fuel feed rate, steam output)**
- **Record pertinent pollution control equipment parameters for a 30-day period that encompasses the test**

- Typical analytical turnaround time is 2-3 weeks
- Dioxin/Furan turnaround may be as long as 4 weeks
- Quick-turnaround analysis expensive
- Suggested reporting schedule
 - Preliminary data provided 30 days after completion of field work
 - Report provided 45-days after field work
- EPA'S electronic reporting tool (ERT)
 - Contractor performs data entry
 - Facility performs data entry

- Detailed instructions on using the ERT provided by EPA
- Only Results from specific methods can be entered using ERT
- Other test methods are to be reported on Excel Templates available from EPA (web addresses provided)
- Report all concentration results corrected to 7% O₂ and on a dry basis
- Include a pdf copy of the test report

DATA REPORTED ONE OF THREE WAYS

1. Electronically to combustion survey@erg.com
2. Upload FTP site
3. Send a CD or DVD to EPA

- If it appears at any time that the October 15 deadline cannot be met, contact EPA to work out a compromise
- EPA has indicated a willingness to be flexible
- Acceptable reasons
 - Seasonal operations
 - Boiler vents to one stack and circumstances do not allow you to shut down the other boilers during test
 - Stack testing contractor availability
 - Analytical laboratory back-up
 - Unexpected problems